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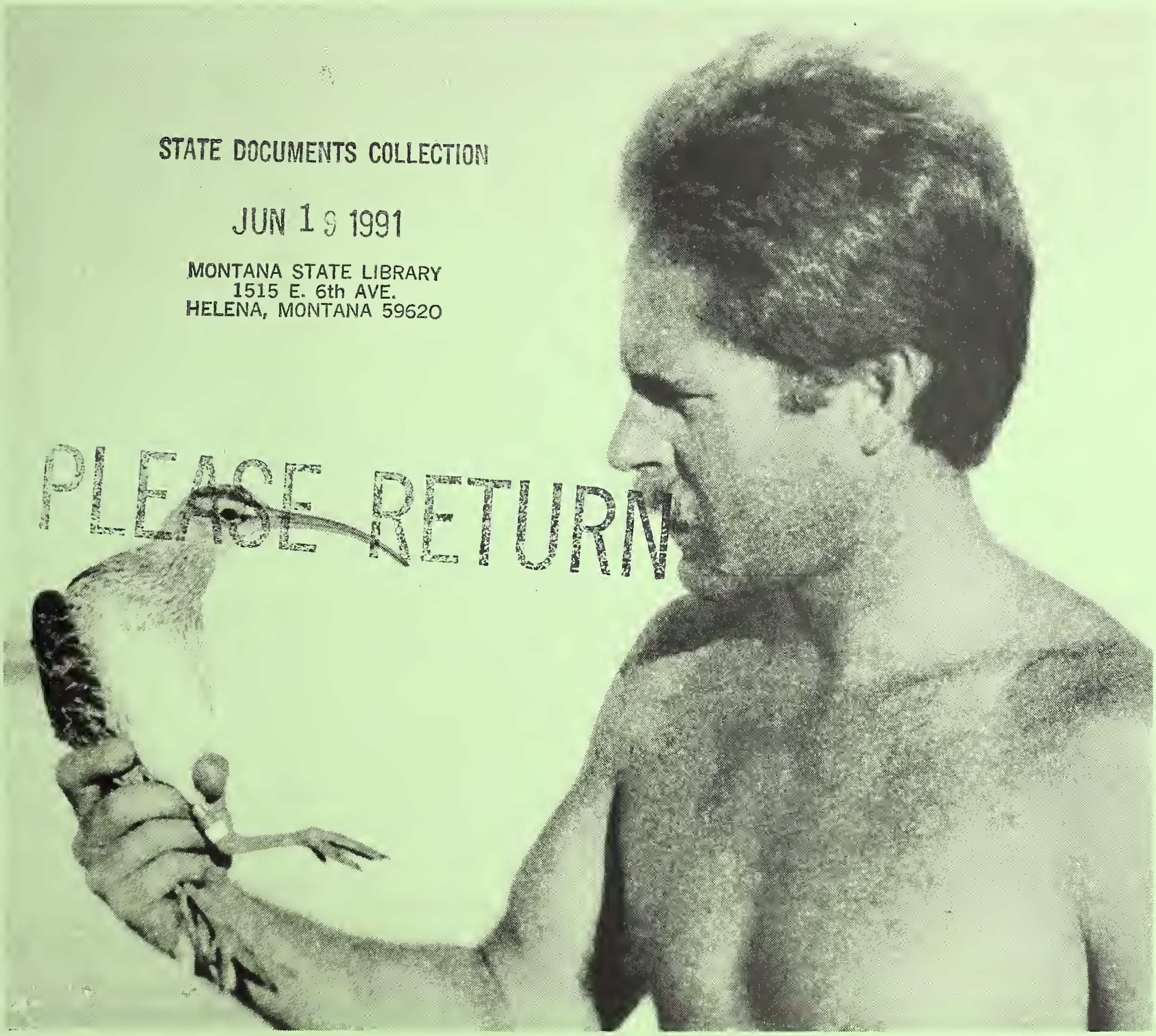

Montana Department of Fish, Wildlife and Parks, USDI Fish and Wildlife Service, University of Montana, and Wildlife Management Institute cooperating.

ANNUAL REPORT -- FY 1990

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Cover--Bristle-thighed curlews are unique among migratory shorebirds in that they become flightless during wing molt in the fall and probably again during a second molt in winter. Clearly, flightlessness during molt is adaptive only in the absence of predators. Since human settlement of Oceania, however, exotic mammals capable of preying upon curlews have been introduced to many Pacific islands. These introductions, coupled with harvest by humans, undoubtedly have reduced bristle-thighed curlew numbers and altered the species' winter distribution. Thus, future conservation of bristle-thighed curlews will depend on a thorough understanding of their molt and movement patterns in the Pacific.

Photo by R. L. Redmond

Motorized roads did not directly affect grizzly bear mortality in southeastern British Columbia during a 9-year study. However, roads built for resource extraction provided easy access to hunters and poachers, resulting in eight mortalities. Postoperational control of vehicles was recommended as a result of the study.

Photo by Bart O'Gara

ANNUAL REPORT

of the

MONTANA COOPERATIVE WILDLIFE RESEARCH UNIT

University of Montana

Missoula, Montana

to

UNIVERSITY OF MONTANA

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

WILDLIFE MANAGEMENT INSTITUTE

U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

Volume 7
October 1989-September 1990

Respectfully submitted,

Bart W. O'Gara

Bart W. O'Gara, Leader

Ball

Joe Ball, Ass't. Leader

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Transplanted beavers moved more frequently and greater distances than natural dispersers.

Left photo by
Holly Harris

Bottom photo by
Kristi DuBois

CONTENTS

Page

MONTANA COOPERATIVE WILDLIFE RESEARCH
UNIT PERSONNEL v
Coordinating Committee v
Unit Staff v
Graduate Students v

COOPERATING AGENCIES vi

PERSONNEL NOTES vii
Honors and Awards Received by Unit Staff and Students vii
Canada Duck Banding and NPWRC Prairie Duck Production vii
BIA-Kerr Dam Wildlife Studies vii
Other Field Studies viii
YCC and Work Study Students viii

ABSTRACTS 1
Dorcas Gazelle Ecology in Morocco 1
Reproductive Biology of Formosan Reeves' Muntjac in I-Lan, Taiwan 1
River Otter Population Status and Habitat Selection in Northwestern Montana 2
Beaver Dispersal in Northwestern Montana 3
Home Range Dynamics, Dispersal, and Reproduction of Reintroduced Fishers in the Cabinet Mountain Wilderness Area, Montana 3
Food Habits, Kill-site Characteristics, and Movements of Wolves in Southeastern British Columbia 4

COMPLETION REPORTS 5
Effects of Motorized Road Use on Grizzly Bear Behavior and Habitat Use 5
Interaction Between Grizzly Bears and Other Predators 5
Nesting Structures for Mallards and Canada Geese: a Handbook 6
Recent History, Ecology, and Management of Canada Geese in the Flathead Valley 7
Impacts of Hydroelectric Development on Raptors and Furbearers in the Flathead Valley 7

RESEARCH PROJECTS 9
Physiologic and Ecologic Studies of the Pronghorn (*Antilocapra americana*) 9

Page

Duck Banding in Canada 9
Nest Success of Upland-Nesting Ducks in the Flathead Valley 10
Age-related Reproductive Rates in the Striped Skunk 11
Ecology of Bald Eagles Wintering Along the Columbia River in South-central Washington 11
River Otter Habitat Use in Northwest Montana 12
Beaver Dispersal in Northwestern Montana 13
Habitat Selection and Home Range Dynamics of Fishers Reintroduced into the Cabinet Mountains of Montana 14
Habitat Selection and Productivity of Interior Least Terns on the Lower Platte River, Nebraska 14
Status and Demography of the Bristle-thighed Curlew 15
Mortality of White-tailed Deer in an Area Recently Recolonized by Wolves 17
Alternative Management Strategies for Musk Deer in Qinghai Province, People's Republic of China 18
Predation on Natural versus Artificial Waterfowl Nests 18
Behavior of Blue Sheep (*Pseudois nayaur*) During the Rut 19
Seasonal Range and Habitat Selection by White-tailed Deer in Northwestern Virginia 20
Movements and Ecology of Wild Yaks in Qinghai Province, People's Republic of China 20
Status of the Grizzly Bear in the Cabinet Mountains, Montana 21
Management Options for Wild Ungulates in Baluchistan, Pakistan 22
Ring-necked Pheasant Recruitment and Survival in Southwestern Idaho 23
Pheasant Recruitment and Survival in Southcentral Idaho 23

CONSERVATION, EDUCATION, AND PUBLIC RELATIONS 25

PAPERS PRESENTED 34

PUBLICATIONS 36

MONTANA COOPERATIVE WILDLIFE
RESEARCH UNIT PERSONNEL

Coordinating Committee

Don Childress, Montana Department of Fish, Wildlife and Parks, Helena
Andrew Sheldon, University of Montana, Missoula
Bart W. O'Gara, U.S. Fish and Wildlife Service, Missoula

Unit Staff

Bart W. O'Gara, Unit Leader
Joe Ball, Assistant Leader
Kerry Foresman, Division of Biological Sciences
Donald A. Jenni, Division of Biological Sciences
Les Marcum, Forestry School
Lee Metzgar, Division of Biological Sciences
Dan Pletscher, Forestry School
Robert R. Ream, Forestry School
Roland L. Redmond, Division of Biological Sciences
Andrew L. Sheldon, Division of Biological Sciences
Richard Taber, Forestry School
"Ginger" Schwarz, Office Manager
Virginia Johnston, Secretary

Graduate Students

Tsui-lan Chen
Ana Dronkert
Sherry Eisner
David Felley
Kurt Forman
Salah Hakim
Nathan Hall
Rich Harris
Kim Heinemeyer
Michael Jackson
Eileen Kirsch
Victoria Kurnat
Yongsheng Liu
Chris Loggers
Tom Maeder
Jeff Marks
Dan Miller
Chyi-Jai Pei
Denise Pengeroth
Jon Rachael
Kevin Roy
Mark Secord
Kuenhi Tsai
Tim Van Deelen
Anne Vandehey
Amjad Virk
Amy Waller

COOPERATING AGENCIES

University of Montana
Montana Department of Fish, Wildlife and Parks
Wildlife Management Institute
USDI Fish and Wildlife Service

Baluchistan Department of Forestry
British Columbia Wildlife Branch, University of British Columbia
Battelle, Pacific Northwest Laboratories
Bureau of Indian Affairs
Confederated Salish and Kootenai Tribes
Council of Agriculture, Taiwan
Craighead Wildlife-Wildlands Institute
Ducks Unlimited
Frankfurt Zoological Society
Government of Pakistan
Idaho Department of Fish & Game
Lee, Robert M.
McIntire-Stennis
Michael Murphy Foundation
Moroccan Department of Waters and Forests
U.S. National Zoo's Conservation & Research Center
Nebraska Game and Parks Commission
Northwest College and University Association for Science
Northwest Plateau Institute of Biology, Xining, People's Republic of China
Pennell, Anna Hubbard
Qinghai Department of Wildlife Management
Taipei City Zoo
U.S. Agency for International Development (USAID)
U.S. Department of Energy
U.S. Fish and Wildlife Service
  Alaska Fish and Wildlife Research Center
  Bowdoin NWR
  Charles M. Russell NWR
  Cooperative Research Units Center
  Division of Refuges, Region 4 and Region 6
  Grizzly Bear Recovery Coordinator's Office
  Lee Metcalf NWR
  Migratory Bird Management Office
  National Bison Range
  Northern Prairie Wildlife Research Center
  Pacific/Hawaiian Islands NWR
U.S. Forest Service
  Flathead, Kootenai, and Lolo national forests
U.S. National Park Service
  Glacier National Park
U.S. Peace Corps
Worldwide Fund for Nature (WWF)

PERSONNEL NOTES

Honors and Awards Received by Unit Staff and Students

Award/Honor Received	Recipient	Reason
Wynn Freeman Award	Nathan Hall Unit Student	Outstanding wildlife student
Bertha Morton Award	Jeff Marks Unit Student	Outstanding graduate scholastic achievement
George Bright Memorial Fellowship	Richard Harris Unit Student and Tim Van Deelen Unit Student	Outstanding graduate scholastic achievement in School of Forestry

The following personnel joined the Unit on nongraduate student appointments of varying length:

Canada Duck Banding and NPWRC Prairie Duck Production

- Richard Jensen
- Heather Johnson
- Thomas Jones
- Shawne Leasure
- Elizabeth Logerwell
- Chris Norton
- Lisa Peskin
- Kevin Podruzny
- James Rataczak

BIA-Kerr Dam Wildlife Studies

- Keith Boggs
- Denver Holt
- Curtis Mack
- Art Soukkala
- Brian Steele

Other Field Studies

Milo Burcham (V-S)
Fred Courville (V-S)
Brian Gay
Darren Johnson
Brian Kaeck (V-S)
Shawne Leasure (V-S)
Henry Normandeau (V-S)
Chris Norton (V-S)
Lori Oberhofer (V-S)
Tim Obritschkewitsch (V-S)
John Peterson (V-S)
Jay Smith (V-S)
Mike Womersley (V-S)

YCC and Work Study Students

Billie Jo Cochran
Ronda Leathers
Norman Merz
Gene Miller
Brita Schneller
Roni Wise

(V-S) = Volunteer with subsistence allowance.
All others are paid positions.

ABSTRACTS

Dorcas Gazelle Ecology in Morocco

Project Leader: B. O'Gara
Student: C. Loggers
Cooperators: Moroccan Dept. Waters and Forests, U.S. Peace Corps, Frankfort Zoological Society
Results:

Data from counts and extended observations were used to estimate the population's size and structure. About 35 territorial males lived on the reserve. Territories of 12 males averaged 30.4 ha and contained 23 dung heaps, with no noticeable concentration of heaps at the territory boundary. Actual territory size and the number of dung heaps/territory were greater than reported due to technique limitations. Territory size may limit the number of breeding males, which reduces the effective population size. Densities were at least 6.9-7.9 animals >12 months old/km^2 and 9.6-10.4 gazelles of all ages/km^2. Herd composition was about 60% adults, 13% subadults, 25% animals <12 months old, and 2% unidentified. Fawning occurred mainly during October and March. Predators of adult gazelles were feral dogs and humans. Average age at death of adult animals whose skulls were found on the Reserve, determined by cementum layers of teeth, was 67 months for females and 53 for males. Longevity was 108 months for females and males. Availability of vegetation and diets of adult gazelles, measured by microhistological fecal analysis, were estimated during 3 seasons. During summer, forbs and shrubs constituted 24% of available forage but comprised 93% of the diet (75% forbs, 18% shrubs). In autumn, consumption of shrubs increased to 63%. Grasses in the diet increased to 50% in spring. Close grouping of individual diets for animals that were associated suggests that the scale at which availability was measured should be reduced.

Reproductive Biology of Formosan Reeves' Muntjac in I-Lan, Taiwan

Project Leader: B. O'Gara
Student: C. Pei
Cooperator: Council of Agriculture, Taiwan
Results:

Data were collected from a captive population in the Taipei Zoo from August 1988 to September 1989, and 439 Formosan Reeves' muntjacs were examined in a game-shop serving the study area. Polyestrus females ovulated when 5 months old and perhaps even earlier, but the first two or more ovulations may be infertile. Postconception and postpartum estri were evident, and the ovarian cycle may persist throughout pregnancy. Males produce sperm and probably are fertile at all stages in the antler cycle. Data suggested calves born during October-January acquired their first set of antlers the following August-September, while others did not form antlers until their second August-September.

Births apparently occurred every month of the year with one peak during June-August 1988, and two less pronounced peaks during March-May 1987 and November 1987-January 1988. The intervals between these peaks (i.e., 7 and 8 months) coincided with the gestation period for the species, suggesting the population might experience a partially synchronized sub-annual (<12 months) breeding cycle. The sub-annual cycle was probably created by the heavy trapping during winter in the study area.

River Otter Population Status and Habitat Selection in Northwestern Montana

Project Leader:	L. Metzgar
Student:	A. Dronkert-Egnew
Cooperator:	Montana FWP
Results:	

Preferred sites for latrines were in a moderate to dense shrub type on concave shorelines with steep underwater banks, adjacent to obstructions and pools in the waterway, and close to confluences and beaver lodges. A discriminant function analysis model for latrine site selection was developed using bank slope, water depth, distance to nearest beaver lodge, waterway obstructions, percent pools in the waterway, and site accessibility. This model correctly classified 85% of the latrine sites and 73% of the available sites. The discriminant function analysis model should aid in locating latrine sites in the Flathead River Valley but requires further testing for use in other areas.

River otter population size in the Flathead River Valley was investigated from April to July using a mark-recapture technique; implantable polylactic acid (PLA) tablets impregnated with radioisotopes were evaluated as a marker of river otter scats and used to obtain an estimate of otter population size. Four river otters were implanted with PLA tablets containing 15-20 µCi of ^{65}Zn, ^{54}Mn, or ^{57}Co. In spring, 371 scats were collected during 5 recapture periods. Three different detection methods failed to find significant amounts of radioactivity in the scats. Failure to detect marks may have been due to the quantity of radioisotope and its decay schedule, the subcutaneous PLA implant delivery system, or the make-up and durability of the scat.

Beaver Dispersal in Northwestern Montana

Project Leaders: L. Metzgar and D. Pletscher
Student: M. Jackson
Cooperator: Montana FWP
Results:

Beavers moved with greater frequency and longer distances from January to June than at other times of year. Artificial dispersers (transplanted beavers) moved more frequently and greater distances than natural dispersers; beavers in areas of low quality habitat moved greater distances more frequently than those in better quality habitat; and male beavers moved greater distances than females.

A discriminant function model for determining age classes of live beavers using morphological measurements was developed from the morphological measurements of 13 known-aged beavers. Beaver weight and tail width provided the greatest separation between age classes, indicating that these measurements may provide a relatively quick and simple means for estimating age of live beavers in the field.

Fourteen of 26 beavers captured in the Rattlesnake Creek study area were tested for the presence of *Giardia lamblia*. One, a 2-year-old male captured on 11/10/88, tested positive.

Home Range Dynamics, Dispersal, and Reproduction of Reintroduced Fishers in the Cabinet Mountain Wilderness Area, Montana

Project Leader: L. Metzgar
Student: K. Roy
Cooperators: Montana FWP, Kootenai National Forest, Anna Hubbard Pennell
Results:

As part of a reintroduction program, 32 fishers (*Martes pennanti*) were imported from Minnesota to the Cabinet Mountains of northwest Montana during 1988-90. All fishers were radio tagged and soft released; 12 were released 1 January 1989, 15 released 1 January 1990, and 5 released 9 March 1990. Fishers were monitored until June of each year, and were relocated a total of 531 times. Movement distances between standard 3-5 day intervals between locations were short in January and February, but increased in the breeding season of March and April. No fisher developed a true home range during the monitoring period. Observed long-range movements during the breeding season were typically not followed by a return to the main study area. At least 10 of the 32 fishers were killed by predators, and 3 were killed by trappers. Two fishers gave birth in the study area, but both were killed shortly after birth and the kits did not survive. All recovered fishers were extremely healthy prior to death. Fishers ate mostly snowshoe hares and deer carrion. The habitat and prey base in the Cabinets seems sufficient to allow fisher recovery, however, high mortality and emigration rates present severe problems to fisher recovery.

Food Habits, Kill-site Characteristics, and Movements of Wolves in Southeastern British Columbia

Project Leader:	R. Ream
Student:	M. Jimenez
Cooperator:	McIntire Stennis

Results:

Six hundred twenty-three prey items were identified from 434 wolf scats collected at den and rendezvous sites and 108 scats picked up during winter tracking. Relative biomass in the wolves' winter diet consisted of 60% elk, 12% deer, 10% bighorn sheep, and 19% moose. Summer scats indicated relative biomass of wolves' diet to be 56% elk, 16% deer, 14% bighorn sheep, and 13% moose. Availability transects found elk 1.8 times more abundant than deer, 3.2 times more than moose, and 4.0 times more than sheep. Aerial game counts showed elk were 1.7 times as abundant as deer, and 2.4 times as abundant as bighorn sheep. Wolf-kill data suggested that wolves selected for deer, however scat analysis did not corroborate this. Comparison of biomass frequencies and prey availability data suggested wolves selected prey based on ungulate densities rather than vulnerability of a particular species. Wolf kills occurred in low elevation areas and moderately thick tree cover. Wolves appeared to take advantage of ungulates using plowed or unplowed roads during winter.

Wolf kills in southern British Columbia and western Montana occurred in low elevation areas and moderately thick tree cover. The wolves appeared to take advantage of large mammals using plowed or unplowed roads during winter.

Photo by
Mike Schlegel

COMPLETION REPORTS

Effects of Motorized Road Use on Grizzly Bear Behavior and Habitat Use

Project Leader: B. O'Gara
Research Associate: B. McLellan
Funding: USFWS
Results:

The causes and rates of grizzly bear mortality in a radio-marked population in southeastern British Columbia were studied for 9 years during a period of timber harvest, gas exploration, and outdoor recreation, including grizzly hunting. During 110 bear-years of radio tracking 55 radio-collared grizzly bears and their dependent offspring, one bear with a functioning radio collar died from natural causes and eight others from human intervention; in addition, four dependent offspring were thought to have died. Excluding trap-related mortalities, the best estimate for the annual survival rates were: 0.82 for cubs, 0.88 for yearlings, 0.93 for subadults, and 0.93 for adults. Of the eight bears killed by human intervention, two were killed by legal harvest, five by illegal harvest (one of these in a trap), and one was killed in a trap by another bear. No mortalities were directly attributable to industrial activities. Resource extraction industries do contribute to grizzly bear mortality indirectly through the construction of roads, which provide easy access to hunters, poachers, and settlers. Road access planning and postoperational control of vehicles are recommended management actions.

Interaction Between Grizzly Bears and Other Predators

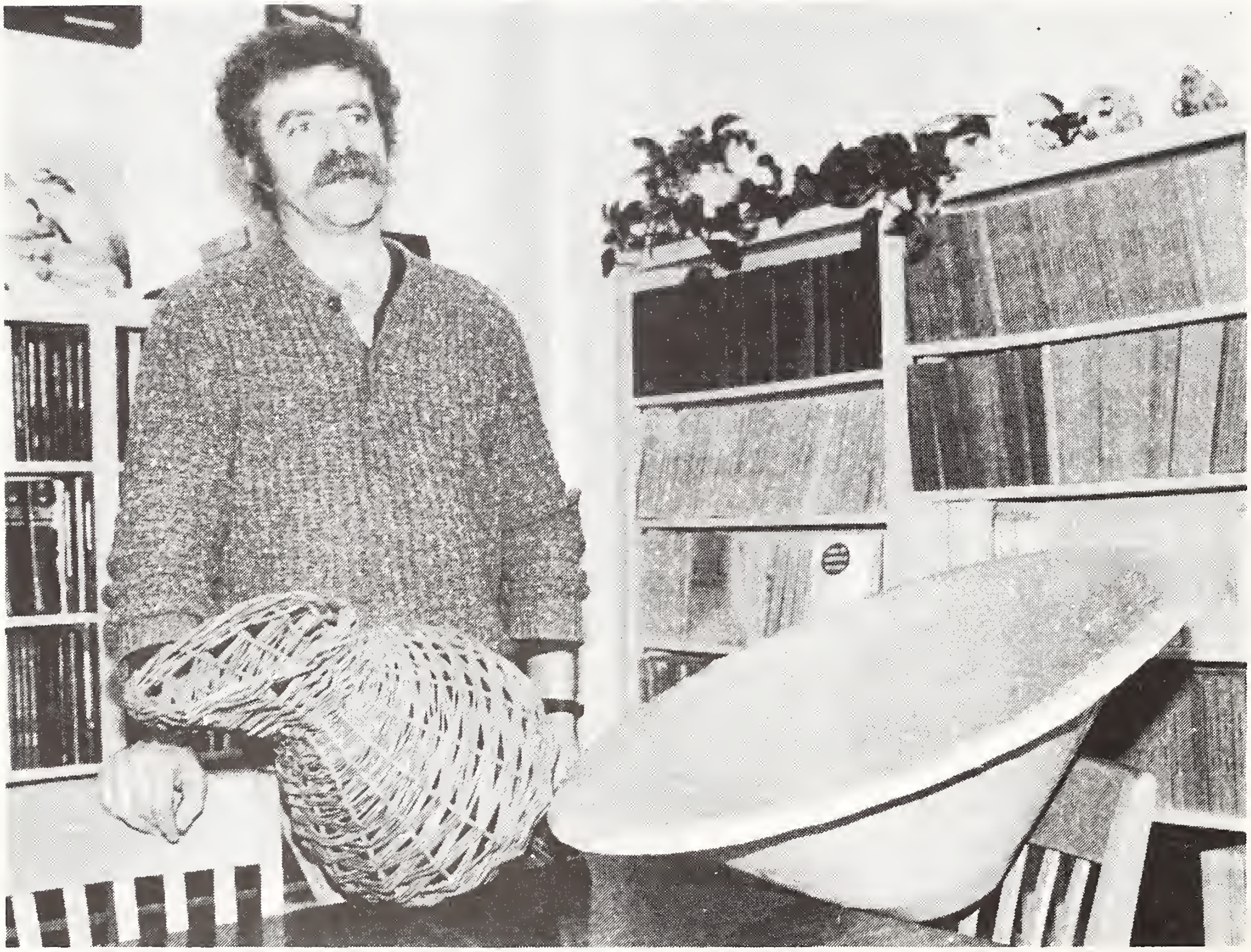
Project Leader: C. Servheen
Funding: USFWS
Results:

Twenty-two black bears and 17 grizzlies were continuously radio tracked to document interactions between the two species. In addition, tracking was coordinated with the four to five radio-collared wolves in the area. Interactions were documented at feeding areas and resting areas and at sites of winter-killed ungulate carcasses. Home range overlap was documented between these species on a seasonal and annual basis. Patterns of habitat use indicated that black bears, especially females, remained in small areas to minimize movements and potential conflicts with larger and more aggressive grizzly bears. Strategies to avoid competition were apparently successful for the black bears and allowed these smaller, less aggressive bears to exist in relatively high densities of grizzly bears.

Nesting Structures for Mallards and Canada Geese: a Handbook

Project Leader:	J. Ball
Research Associate:	S. Ball
Funding:	USFWS
Results:	

One chapter (Artificial Nest Structures for Canada Geese) was published during 1990 in USFWS Waterfowl Management Handbook--Leaflet Series. Final revisions of the main Nest Structure Handbook are underway, and a second chapter (Artificial Nest Structures for Ducks) is being prepared for the USFWS Series.



Traditional woven mallard nest baskets from Holland lack the durability and ease of mass production associated with fiberglass conical baskets popular in North America. However, the traditional design retains nest material better, provides greater protection from avian predation, and may provide cues that result in higher occupancy rates.

Photo by Howard Skaggs

Recent History, Ecology, and Management of Canada Geese in the Flathead Valley

Project Leaders:	J. Ball, J. Craighead
Funding:	Wildlife-Wildlands Institute, MT CWRU
Results:	

A final draft of the monograph has been submitted to Wildlife-Wildlands Institute, which is handling publication.

Impacts of Hydroelectric Development on Raptors and Furbearers in the Flathead Valley

Project Leader:	J. Ball
Research Associates:	C. Mack, A. Soukkala
Funding:	Bureau of Indian Affairs
Results:	

The current hydrograph of Flathead Lake involves annual maxima 0.3 m higher than historical levels, reached 50 days later in the year. In addition, peak levels are much less variable currently than before the construction of Kerr Dam. Annual minima currently are 0.7 m higher than occurred historically, and occur more than 4 months later in the year. On the lower Flathead River, the operation of Kerr Dam has resulted in flows that are lower during spring (-30%) and summer (-26%), but higher during fall (+100%) and winter (+192%) than occurred historically. Median peak annual flows have been reduced from 52,207 cfs historically to 38,605 cfs currently. Flow reversal rates are 400-500% more common currently than historically. Flooding events occurred historically about once every 2 years with an average duration of 22 days: currently, they occur once every 9 years with an average duration of 11 days.

Impacts of the altered hydrograph on wildlife habitats of Flathead Lake included the destruction/degradation of 522 ha (1,289 acres) of wet meadow, emergent marsh and seasonally flooded mud flat habitat into a zone of aquatic/mud flats with narrow bands (<80 ha) of emergent or riparian vegetation along the current high water mark. Remnant stands consist mostly of dense, monotypic cattail stands that are of little value to most wildlife species because they are dewatered during winter, spring, and early summer.

We estimate the loss of wildlife habitat along the lower Flathead River that is attributable to the impacts of Kerr Dam to be between 1,177 and 2,725 ha (2,908 and 6,731 acres); the former figure is definitely very conservative.

The restriction of peak flood flows by the operation of Kerr Dam has virtually eliminated recruitment by early successional species such as cottonwoods and willows. Age distribution surveys of cottonwood stands indicated that only 10% of the stands sampled were sapling or pole stages, which is inadequate to replace the current mature stands (68%). Given the current rate of loss, the riparian gallery forest will cease to exist by year 2059, when the current generation of cottonwoods reaches senescence, if the present hydrograph persists.

Current and probably future impacts of these changes on muskrats, beavers, bald eagles, and ospreys are documented and discussed.

If the current rate of loss continues, no cottonwoods will remain along the lower Flathead River to provide nesting habitat for birds such as this great blue heron.

Photo by Dave Ellis

RESEARCH PROJECTS

Physiologic and Ecologic Studies of the Pronghorn (*Antilocapra americana*)

Project Leader: B. O'Gara

Cooperators: National Bison Range, USFWS; Montana Department of Fish, Wildlife and Parks; and the Wildlife Management Institute

Objectives:

To study:

1. the reproductive physiology of male and female pronghorn;
2. the physiology and function of scent glands;
3. food habits related to changes in range conditions;
4. horn growth and casting; and
5. the relationships of pronghorns to other artiodactyls.

Results:

Twelve book chapters are in press. When they are published, this project will be terminated.

Duck Banding in Canada

Project Leader: J. Ball

Student Technicians: Varies, 4 to 6 annually

Cooperators: Migratory Bird Management Office, USFWS

Objectives:

1. Trap and band 2000 mallards and up to 1500 pintails and 1000 of each of the other species available. This quota will be sought at each of 10 banding stations;
2. maintain accurate records and provide summary reports from each station to the Migratory Bird Management Office; and
3. provide students from the Montana Cooperative Wildlife Research Unit with training in waterfowl research techniques and an ecological perspective that can only be obtained through on-the-ground experience.

Results:

Vary annually. Detailed annual reports are available. The Unit will be unable to participate in this work using Research Work Orders in the future. We do hope to develop some mechanism that allows continued participation by our students.

Nest Success of Upland-Nesting Ducks in the Flathead Valley

Project Leader:	J. Ball
Student Investigator:	N. Hall
Cooperators:	National Bison Range, USFWS; Montana Department of Fish, Wildlife and Parks

Objectives:

1. Document nest success and, where possible, causes of nest failure on both removal and nonremoval areas;
2. evaluate costs and benefits of skunk removal;
3. attempt to quantify the relative importance of pair habitat; size, type, and condition of cover; and the presence or absence of predators; and
4. submit management recommendations.

Results:

This study was conducted in glaciated pothole habitat of the lower Flathead Valley in west-central Montana. The area is similar to much of the Prairie Pothole Region in topography, hydrology, land use, high nest predation rates, and faltering duck populations. Striped skunks were numerous and were the primary mammalian nest predator. Coyotes were common; red foxes and raccoons were uncommon. Nesting studies conducted in the Ninepipe area in 1986 and 1987 provided baseline information on nest success with habitat management (the provision of dense nesting cover). Mayfield estimates of nest success for all species of upland-nesting ducks averaged 22%, with no significant difference between years. Nest success of mallards was 10% both years, comparable to recent rates in much of the Prairie Pothole Region, and well below the 15% level theoretically needed to maintain populations. A skunk removal program was initiated in the spring of 1988 on a 50-km^2 area of federal, state, tribal, and private lands surrounding Ninepipe National Wildlife Refuge. Although 109 skunks were removed, nest success did not change significantly (19%). During 1989, trapping began earlier and intensity was doubled on the key nesting areas, resulting in the removal of 77 skunks. Nest success increased significantly to 44% from the 1986-1988 average (19%). Mallard nest success increased nearly 4-fold, from 10% in 1986-1988 to 37% in 1989. Pablo National Wildlife Refuge served as an experimental control (nonremoval) area. Nest success there did not differ significantly among years ($\bar{x}$ = 29%), although the analysis was hampered by small sample sizes. Improved nest success at Ninepipe in 1989 should result in increased homing by hens and be reflected in higher nest densities in 1990.

Nest densities did in fact increase (2X) during 1990. Number of nests hatched during 1990 were approximately equal to the number of nests hatched the previous 4 years combined. Nest success increased significantly during 1990 to 59% for all species combined and 53% for mallards. This increase in success and number of nests hatched during 1990 should result in even higher nest densities next year. Even if the nest success does not change next year, the number of nests hatched and overall duck population should continue to increase. Nest success at Pablo NWR did not change significantly this year.

Age-related Reproductive Rates in the Striped Skunk

Project Leaders:	J. Ball and K. Foresman
Student Investigator:	D. Pengeroth
Cooperator:	USFWS, National Bison Range

Objectives:

1. Determine age-related reproductive rates among striped skunks; and
2. describe the reproductive characteristics of a striped skunk population in western Montana.

Results:

The striped skunk was identified as the primary predator associated with low (10-20%) duck nest success in the Flathead Valley. Skunk densities were reduced by trapping to determine whether nest success would increase; 109 skunks were removed between 7 April and 19 July in 1988 and 73 between 21 March and 6 July in 1989. Most of the skunks were trapped along irrigation ditches and in dense nesting cover. Analyses to determine age and reproductive rates are underway.

Ecology of Bald Eagles Wintering Along the Columbia River in South-central Washington

Project Leaders:	J. Ball and R. McClelland
Student Investigator:	S. Eisner
Cooperators:	Northwest College and University Association for Science; U.S. Department of Energy; and Battelle, Pacific Northwest Labs

Objectives:

1. Determine the combination of environmental factors that best explains bald eagle distribution along a 136-km stretch of the Columbia River between the Tri-Cities and Wanapum Dam. Compare diurnal and nocturnal distribution on the Hanford portion of this stretch;
2. summarize perch use over the entire study area and for perch trees on the Hanford Reach, characterize individual trees and tree clumps used for diurnal and nocturnal perches and compare with trees not used; and
3. describe and quantify communal night roost behavior.

Results:

A draft of the thesis is complete, and is undergoing revision.

River Otter Habitat Use in Northwest Montana

Project Leaders:	L. Metzgar
Student Investigator:	A. Waller
Cooperator:	Montana Department of Fish, Wildlife & Parks

Objectives:

1. Identify habitat components of significance to river otters within home ranges through comparisons of radio locations and random sites;
2. evaluate the use of sign surveys for indicating river otter habitat through comparisons of latrine-site and nonlatrine-site radio locations; and
3. refine sign survey techniques to document the distribution of river otters in northwest Montana.

Results:

The student investigator is preparing her thesis.

Beaver Dispersal in Northwestern Montana

Project Leaders:	D. Pletscher
Student Investigators:	T. Van Deelen
Cooperators:	Montana Department of Fish, Wildlife and Parks; Lolo National Forest

Objectives:

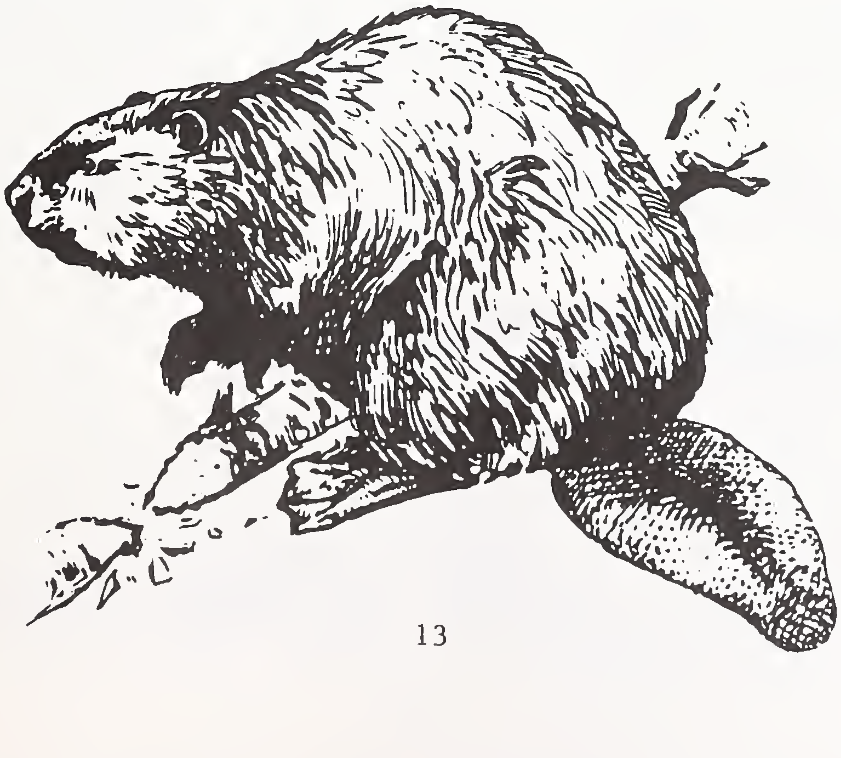
1. Quantify survivorship of dispersers and direction and distance of beaver dispersal in selected drainages in northwestern Montana;
2. survey selected drainages to delineate experimental areas and determine the availability of habitat for dispersing beavers; and
3. gather supplemental data on age, sex, and productivity of beaver populations within the selected study areas.

Results:

Fifty beavers were trapped at the beginning of 1990; 14 were judged to be of dispersal age and were implanted with radio transmitters. The movements of the radioed beavers will be recorded until they become sedentary for the winter.

Problems with the study design and fiscal realities forced the study to focus on one study area (Fish Creek) for the 1990 field season. The trapping efforts and the monitoring of radioed animals during the 1990 field season has generated good information on the movement and demographics of the Fish Creek beaver population.

Stream surveys and examinations of trapper-returned carcasses will supplement study of beaver demographics. Data analysis will be completed during the winter 1990-91 and the thesis will be completed by July 1991.



Habitat Selection and Home Range Dynamics of Fishers Reintroduced into the Cabinet Mountains of Montana

Project Leader:	K. Foresman
Student Investigator:	K. Heinemeyer
Cooperators:	Montana Department of Fish, Wildlife and Parks; Kootenai National Forest, USFS

Objectives:

1. To restore a viable fisher population to the Cabinet Mountains;
2. to examine success of different release techniques;
3. to study habitat selection; and
4. to examine dispersal and home range dynamics.

Results:

Seven fishers reintroduced into the Cabinet Mountains in northwestern Montana during the winter of 1990 have been monitored through the spring and summer using radiotelemetry. Five of these animals are within or adjacent to the Cabinet Mountain Wilderness; two have settled into areas southwest of the study area. All animals seem to have stabilized their activities into areas resembling home ranges. Radio locations obtained from the air and the ground will be used to delineate possible home ranges and habitat selection of these fishers, with monitoring continuing into the fall and winter.

The third and final release of fishers took place in autumn of 1990. Forty fishers were obtained from Wisconsin and Minnesota, using box traps, and transported to Missoula. Twenty-five individuals will be equipped with radio transmitters. All animals will be ear-tagged for future identification. To examine possible effects of release techniques, half the animals will be "soft" released and the others will be "hard" released. Subsequent data collection will consist of radio tracking and snow tracking to gain information on habitat use and post-release movements. Data collection will continue on all animals in radio contact through January 1992, providing long-term data on home range selection and establishment, seasonal habitat use, and reproductive success.

Habitat Selection and Productivity of Interior Least Terns on the Lower Platte River, Nebraska

Project Leader:	L. Metzgar
Student Investigator:	E. Kirsch
Cooperators:	Nebraska Game & Parks Commission and USFWS, Northern Prairie Wildlife Research Center

Results:

The breeding biology and habitat use of least terns and piping plovers on natural sandbar and man-made spoil habitats along the lower Platte River, Nebraska were studied from 1987 through summer 1990. Components of productivity as well as causes for egg and chick loss for birds nesting on a sample of 3-6 colony sites on each habitat were quantified. Each site was monitored from early incubation until birds abandoned the site.

Productivity for least terns and piping plovers is very low primarily because of poor chick survival. Productivity did not differ between sandbar and spoil habitats for either species. Nesting, hatching, and fledging success varied among sites within both habitats, possibly masking a habitat-related difference.

Predation was the primary cause for egg loss overall and was greater on spoils than on sandbars. Important predators were coyotes on spoils and mink on sandbars. Flooding destroyed many eggs on sandbars, but did not reduce productivity on sandbars compared to spoils during this study. Egg abandonment was also high, and may be related to human disturbance on spoils. Very few tern and plover carcasses were found, probably because most chicks were taken by predators. K factor analysis revealed that least tern egg mortality influences productivity on sandbars for the peak nesting period. Chick mortality influences productivity the most on spoils during the peak nesting period and over the entire breeding season. For piping plovers, chick mortality influences productivity on both habitats and egg mortality is relatively unimportant.

Status and Demography of the Bristle-thighed Curlew

Project Leaders:	R. Redmond and J. Ball
Student Investigator:	J. Marks
Cooperators:	U.S. Fish & Wildlife Service, Alaska Fish and Wildlife Research Center and Pacific Islands NWR

Objectives:

1. Describe molt by age class, including timing, duration, and pattern of feather replacement;
2. describe molt-induced flightlessness, including duration of the flightless period and habitat use during flightlessness, and estimate the proportion of adults that becomes flightless;
3. determine whether curlews molt remiges twice during the nonbreeding season, and if so, determine whether they become flightless during the second molt;
4. determine whether curlews stay on Laysan through the winter after completing molt in autumn;
5. assess the influence of sunlight (i.e., UV radiation) on wear of curlew flight feathers, and compare the resistance to wear in primaries of co-occurring shorebirds on Laysan; and

6. assess hormonal correlates of molt.

Results:

This year's field work on Laysan Island began in mid-August and no results are yet available to report from this work. Several resightings of color-banded curlews occurred throughout the Hawaiian Islands in August 1990, which provide insight into the migration and inter-island movement patterns of these birds. For example, on 8 August, #866 was seen at Kahuku Point on Oahu; two weeks later it was back on Laysan. This individual was originally banded 18 August 1989 on Laysan. On 9 August (1990) Marks resighted three color-banded curlews on Midway. One was originally banded 15 July 1989 on the Yukon Delta NWR in Alaska; the other two (#803 and #839) were color-banded on Laysan in 1989. The Alaska bird was subsequently resighted on Laysan, but not the other two. On 11 August, Marks resighted 16 color-banded curlews on Lisianski, and seven of these were seen subsequently on Laysan. Finally, on 18 August, #658 was resighted at South Point on Hawaii. This individual was first captured 5 May 1988 on Laysan and recaptured there 24 August 1989. It has not been resighted this year on Laysan.

In September, Redmond traveled to Baker and Howland Islands, and Palmyra Atoll with the U.S. Coast Guard to count curlews and look for color-banded individuals. No color-banded curlews were seen on any of these islands, which when combined with the previous resightings, suggests that curlews banded on Laysan remain in the Northwestern Hawaiian Islands at least through the fall to molt.

On Baker and Howland, two small islands (<160 ha) located just north of the Equator, Redmond counted 18 curlews and 24 curlews, respectively. These counts are noteworthy for what they indicate about the effects of introduced predators on the species' nonbreeding distribution. In the mid-1930s, cats were introduced to both islands. They were successfully removed from Baker in the mid-1960s, but they remained on Howland until 1986. Since the 1960s when surveys began, no curlews and very few other shorebirds have been reported during fall trips to Howland, whereas on Baker, only 58 km away, curlews were reported regularly. The only expedition to Howland since 1986 occurred in March 1988. No sign of cats was found, and a few curlews were seen. Redmond also found no evidence of cats on Howland. These findings confirm that feral cats were somehow responsible for the long absence of curlews from Howland Island, at least during the fall months. Considering that bristle-thighed curlews become flightless during their prebasic molt in autumn, they certainly would be vulnerable to predation during this period. It remains to be determined, however, whether migrating curlews actually stay to molt where predators have been introduced, or whether they can detect the presence of predators and migrate on to safe sites prior to the onset of their molt. Nevertheless, future conservation and management of bristle-thighed curlews almost certainly will depend on the maintenance of predator-free habitats throughout the species' nonbreeding range.

Mortality of White-tailed Deer in an Area Recently Recolonized by Wolves

Project Leader:	D. Pletscher
Student Investigator:	J. Rachael
Cooperators:	U.S. Fish & Wildlife Service, British Columbia Wildlife Branch, Flathead National Forest, Montana Department of Fish, Wildlife and Parks, and Glacier National Park

Objectives:

1. Evaluate cause-specific mortality of white-tailed deer within the area recolonized by wolves;
2. describe seasonal distribution of white-tailed deer, including migration patterns and key areas of seasonal use;
3. select techniques and initiate sampling strategy to develop an index of deer abundance; and
4. determine age and sex structure of white-tailed deer population.

Results:

Of 23 deer captured and radio collared from January to March 1990, 4 died and 1 radio transmitter ceased functioning. Wolves killed 1 radio-collared deer in mid-March, and are probably responsible for predation on another in early June. A bear probably killed a radio-collared deer, but it is possible that the bear may have scavenged the carcass shortly after the deer died. The fourth deer mortality was the result of a Glacier Park Management action in which the human-habituated animal was injured during a relocation attempt and had to be euthanized.

A population monitoring index has been initiated, and preliminary estimates of population sex and age ratios have been made. Seasonal distribution of marked animals is monitored continually, and we have begun intensive habitat sampling of fawning areas.

We hope to capture and radio collar 11-12 more deer during December. Field work will continue through summer 1991.

Alternative Management Strategies for Musk Deer in Qinghai Province, People's Republic of China

Project Leader: B. O'Gara

Student Investigator: R. Harris

Cooperators: Northwest Plateau Institute of Biology, Xining, People's Republic of China; Robert M. Lee; Worldwide Fund for Nature (WWF)

Objectives:

1. Document the breeding and social structure of harvested and unharvested musk deer populations in the vicinity of the Gar Lamasery, Beiza Forest, Nangqian County, Qinghai;
2. quantify survival and recruitment rates of harvested and unharvested musk deer populations;
3. assess the economic benefits potentially available to the local community from the sale of musk under varying harvest management programs; and
4. assess the social potential for implementing alternative harvest management programs on a local level.

Results:

The first field season was completed from 21 August to 14 November 1989. Experiments in capture techniques served to train both the investigator and a crew of Tibetans. Musk deer were observed on 114 occasions, and valuable behavioral information was recorded. A pilot study for assessing the feasibility of using fecal pellet counts as an index to musk deer density was completed.

Predation on Natural versus Artificial Waterfowl Nests

Project Leader: J. Ball

Student Investigator: V. Kurnat

Cooperator: U.S. Fish and Wildlife Service: Refuges, Region 6; National Bison Range; Metcalf NWR; C. M. Russell NWR

Objectives:

1. Develop a standardized, widely applicable method for using artificial nests to assess natural nest predation on ground-nesting ducks;
2. determine whether the use of artificial nests can provide a reliable index to predation on natural nests; and
3. test the hypothesis that scented nests attract a more representative sample of local predator populations than unscented nests.

Results:

Ground-nesting ducks often suffer high nesting mortality, frequently having success rates that are insufficient to maintain recruitment at a level capable of sustaining stable populations. Predation accounts for 75-85% of nest failures. We are attempting to develop an index to natural nest success that will facilitate data collection and alleviate the disturbance to hens and habitat associated with nest dragging. Researchers have used artificial nests in a variety of studies to investigate the relationship between habitat structure and nest success. However, the relationship between artificial and natural nest success has not been clearly established, particularly over a large geographic range with diverse predator populations.

During the 1989 and 1990 nesting seasons we placed more than 1,500 artificial nests on 11 sites throughout Montana. One-half of each sample was scented with commercial scent disks to determine whether scented nests attracted a more representative sample of mammalian and avian predators than unscented nests. In 1989, the natural nest success on 9 sites ranged from 0 to 96%, while artificial nest success ranged from 4 to 96%. Preliminary plots of the data suggest that the relationship between natural and artificial nest success is significant, but with substantial variation. The exact relationship will be determined through regression analysis upon completion of the 1990 nesting season.

Behavior of Blue Sheep (*Pseudois nayaur*) During the Rut

Project Leader:	B. O'Gara
Student Investigator:	Y. Liu
Cooperator:	Northwest Plateau Institute of Biology, Xining, People's Republic of China; Qinghai Department of Wildlife Management (China); Robert M. Lee

Objectives:

1. Develop a behavioral repertoire of blue sheep during the rutting season;
2. compare the rutting behavior of blue sheep to that of *Ovis* spp. and *Capra* spp.; and
3. investigate the impact of human activities on the behavior of blue sheep.

Results:

A study area in China has been selected. The student is taking courses at the University of Montana and gaining experience with wild sheep by working with a researcher on the National Bison Range.

Seasonal Range and Habitat Selection by White-tailed Deer in Northwestern Virginia

Project Leader: B. O'Gara

Student Investigator: S. Hakim

Cooperators: National Zoo's Conservation and Research Center, Front Royal, Virginia

Objectives:

1. Determine seasonal home-range size and distribution relative to habitat;
2. compare seasonal habitat selection of deer;
3. identify variables that influence such selection and look at seasonal changes;
4. determine if seasonal activity patterns are related to home range size or forage availability;
5. describe family interactions and group size; and
6. estimate population structure.

Results:

Data collection is complete. The student is taking courses and preparing his dissertation.

Movements and Ecology of Wild Yaks in Qinghai Province, People's Republic of China

Project Leader: B. O'Gara

Student Investigator: D. Miller

Cooperators: Northwest Plateau Institute of Biology, Xining, People's Republic of China; Robert M. Lee

Objectives:

1. Classify vegetal and structural characteristics of wild yak habitat in Qinghai Province.
2. determine population characteristics (density, movements, sex ratio, age structure) for wild yaks in the intensive study area;
3. determine seasonal habitat selection and use, seasonal food habits, and activity patterns for wild yaks;
4. assess range condition trends and competition between wild yaks and domestic livestock for forage.

Results:

The student has just completed his first field season and returned to his job in Bhutan.

Status of the Grizzly Bear in the Cabinet Mountains, Montana

Project Leader:	C. Servheen
Field Director:	W. Kasworm
Field Biologists:	H. Carriles, T. Radandt, K. Roy, and T. Thier
Cooperator:	USFWS, Office of Grizzly Bear Recovery Coordinator

Objectives:

1. Develop information on habitat use and movement patterns of grizzly bears in the area. Determine habitat preference by season and assess the relationship between habitats affected by man, such as logged areas, and grizzly bear habitat use in the Yaak River drainage. Determine the relationship and movement patterns between the grizzly bears in the U.S. and Canadian areas of the Yaak;
2. initiate methods to determine the population characteristics of the Yaak grizzly population in terms of reproductive success, age structure, and mortality causes;
3. initiate methods to determine the relationship between human activity and grizzly bear habitat uses through description of avoidance zones, should they exist, and the use of habitat in relation to ongoing logging, old cutting units, open and closed roads, and human residences;
4. suggest management techniques to limit human-induced mortality of grizzly bears in the Yaak area; and
5. relocate up to 4 subadult female grizzly sows into the Cabinet Mountains and monitor their subsequent movements.

Methods:

1. Initiate a capture and marking program to sample grizzly bears in the Yaak;
2. monitor by aircraft and ground tracking radio-collared bears captured in the Yaak;
3. initiate habitat productivity sampling to compare the productivity of major bear foods such as _Vaccinium_ spp. to similar habitat components in the Cabinet Mountains portion of the Cabinet Yaak ecosystem;
4. suggest management techniques to limit human-induced mortality of grizzly bears in the Yaak area; and
5. capture appropriate bears in British Columbia and move them into the Cabinets.

Results:

This project continued in 1990. Five grizzly sows are currently radio collared in the Yaak area. A single subadult female bear was captured in July and moved into the Cabinets. This bear was intensively monitored and denned within 4 miles of the release site. The project will continue in 1991.

Management Options for Wild Ungulates in Baluchistan, Pakistan

Project Leader:	B. O'Gara
Student Investigator:	A. Virk
Cooperators:	U.S. Agency for International Development (USAID); Government of Pakistan; Department of Forestry, Baluchistan

Objectives:

1. Collect information on the current distribution and status of wild ungulates in Baluchistan;
2. identify causes of population declines;
3. quantify the role and degree of possible participation by tribal people in the conservation of wildlife;
4. quantify the economic value of wildlife conservation in Baluchistan; and
5. develop management guidelines that can help the government of Baluchistan to preserve wildlife.

Results:

Baluchistan, the largest province of Pakistan, holds a special position with regard to its wild ungulates. Wild ungulates in the province include Suleiman markhor (*Capra falconeri jerdoni*), Kabul markhor (*C. f. megaceros*), Chiltan markhor (*C. f. chiltanensis*), wild goat (*C. aegagrus*), Baluchistan urial (*Ovis orientalis blanfordi*), goitered gazelle (*Gazella subgutturosa*), Chinkara gazelle (*G. gazelle*), and wild boar (*Sus scrofa*). Some of these animals are endangered or reduced to small numbers in isolated locations.

The student investigator visited Baluchistan during summer 1990. Data regarding current status, distribution, and causes of decline in big game populations were collected from various agencies in Pakistan. Besides these data, information regarding numbers of livestock, local human populations, and land-use practices near the potential habitats of the above mentioned species were also collected from concerned departments and local people. The draft management plan will be submitted during summer 1991.

Ring-necked Pheasant Recruitment and Survival in Southwestern Idaho

Project Leader: J. Ball

Student Investigator: D. Felley

Cooperator: Idaho Department of Fish and Game

Objectives:

1. Estimate hen survival;
2. estimate hen success rate;
3. estimate brood survival;
4. integrate information from objectives 1, 2, and 3 to produce a simple recruitment model;
5. describe the habitat types used for nesting and brood rearing, and describe the relationship between habitat and recruitment;
6. describe the phenology of crop growth and harvest and relate it to the phenology of nesting and brood rearing; and
7. identify mortality factors limiting pheasant populations.

Results:

A recruitment study of a ring-necked pheasant (*Phasianus colchicus*) population in Canyon County, Idaho, was initiated in February 1990. Radio-collared hens were followed through spring dispersal, nesting, and brood-rearing periods. Data were collected on hen survival, nest success, and brood survival to develop a recruitment model of the population. Initial results estimate autumn recruitment to be 1.13 juvenile hens for each hen entering the breeding season. Better survival estimates are needed to fully evaluate population trends. Data were also collected on nest success in relation to nest site selection and habitat availability. Early nest attempts in grain were most successful, producing more broods than all other cover types combined.

Pheasant Recruitment and Survival in Southcentral Idaho

Project Leader: J. Ball

Student Investigator: T. Maeder

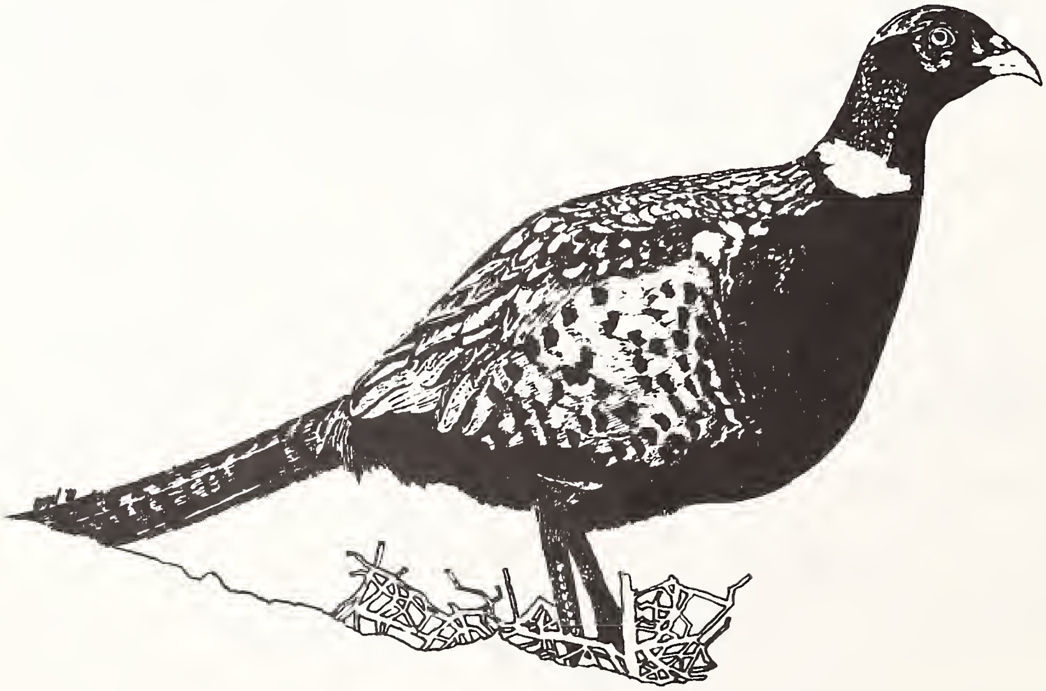
Cooperators: Idaho Department of Fish and Game

Objectives:

1. Evaluate pheasant recruitment in southcentral Idaho;
2. estimate survival of hen pheasants during the spring-summer reproductive period;
3. integrate information from objectives 1 and 2 to produce a simple recruitment model;
4. evaluate recruitment and survival of wild introduced pheasants compared to indigenous pheasants;
5. describe the vegetative types used by nesting and brooding pheasants, and the relationship between habitat and recruitment; and
6. identify mortality factors limiting pheasant populations in southcentral Idaho.

Results:

Forty radio-collared hen pheasants were followed during the 1990 reproductive season. Twenty-two were local hens and 18 were transplanted wild hens. Overall survival rate of hens for the period monitored was 0.417. The main causes and times for hen mortality were by predation just after release and during spring dispersal, and by swathing during nest incubation. Canine predation was the most common type of predation. Total nest success for the reproductive period was 41% and hen success was 61%. A recruitment model indicated a slight increase of 6% in the population. No difference was apparent in survival between local and transplanted hens. Transplanted hens were 3 times more likely to hatch a nest than local hens.



CONSERVATION, EDUCATION, AND PUBLIC RELATIONS

Bart O'Gara, Unit Leader

25 October	Collected and necropsied a sick bighorn ram for the National Bison Range.
26 October	Met with biologists of the Lolo National Forest to map viewing areas for a wildlife interpretive program.
8 November	Presented a lecture on ecology of wildlife diseases and parasites to a population ecology class, about 40 undergraduates and graduates.
13 November	Reviewed a 40-page manuscript for the Journal of Wildlife Management.
13 November	Lectured for 3 hours on Montana carnivores and predation to Montana Wildlife class, about 60 undergraduates.
15 November	Presented a 4-hour, slide-assisted lecture on necropsy techniques to an advanced wildlife class; 38 undergraduate and graduate students.
29 November	Gave a 4-hour lecture on capture and drugging to advanced wildlife class, 38 undergraduates and graduate students.
7-8 December	Met with officials from Glacier National Park concerning establishment of a Park Research Unit at the University of Montana.
8 January	Lectured on evolution of wildlife management in North America to Man and Wilderness class (School of Forestry), 16 undergraduate students.
10 January	Lectured on wildlife management in Eurasia to Man and Wilderness class.
12 January	Lectured on wildlife management in southern Africa to Man and Wilderness class.
20 February	Met with Forest Service and Montana Department of Fish, Wildlife & Parks personnel to discuss establishment of a mountain sheep herd on Mount Sentinel.
22 February	Lectured on conservation through use to the Global Natural Research Problems class--12 graduate students and professors.
23 February	Lectured on parks of Africa and Asia to the Park Management class--15 undergraduates.

2-6 March	Attended International Council for Game and Wildlife Conservation, of the Caprini Working Group, meeting in Reno, Nevada. Contributed information on wild sheep and goats in central Asia.
16-21 March	Attended North American Wildlife Conference in Denver. Also visited Region 6 Headquarters and toured the Rocky Mountain Arsenal to make recommendations to the U.S. Fish and Wildlife Service and U.S. Army concerning a pronghorn transplant to the Arsenal.
March/April	Necropsied 2 moose, 2 elk, 2 mule deer, and 9 fishers for various studies. Determined cause of death or species of predator for all but one.
19 April	Lectured to wildlife policies class on functions of the Fish and Wildlife Service and federal wildlife laws--20 undergraduates.
24 April	Presented 2 1-hour lectures on wildlife diseases and parasites and identifying predator kills to a warden's training program for Montana Department of Fish, Wildlife and Parks at Fairmont Hot Springs--about 100 wardens.
26 April	Attended a meeting regarding relocation of sheep to Mount Sentinel.
26 April	Met with Javier Bellate of Bariloche, Argentina concerning predator problems in Argentina and a guancho study.
5 May	Spent 1/2 day on the National Bison Range lecturing on "high country animals" to high school teachers attending the Outdoor School--21 teachers.
7-8 May	Escorted Boguslaw Bobec (visiting professor from Poland) and Cai Guiquin (visiting professor from China) around the National Bison Range and other western Montana points of interest to wildlife managers.
11 May	Gave two slide-assisted lectures to junior high students at the Florence-Carlton School, Change-of-Pace day, on pronghorn behavior and predation--14 and 29 students.
15 May	Gave 1.5-hour lecture on livestock and big game predation by coyotes and eagles to a wildlife issues class (non-wildlife majors)--about 45 undergraduates.
16 May	Lectured for 6 hours to 5th graders at Superior Outdoor School on how a scientist works, wildlife research and management, predation, and pronghorn behavior and biology --37 students.

17 May	Lectured to students at Washington Middle School on wildlife management--70 students.
21-25 May	Attended pronghorn workshop at Silver Creek, Colorado.
15 August	Reviewed a 16-page manuscript for Journal of Wildlife Management.
20-24 August	Attended Cooperative Research Unit meetings in Raleigh, N.C.
5-6 September	Attended annual meeting of Montana APHIS ADC personnel near Boulder, Montana.
11-30 September	Collected 7 white-tailed deer and 3 bighorn sheep to feed 6 orphaned wolf pups in the Ninemile drainage near Missoula.

Joe Ball, Assistant Unit Leader

2 October	Refereed 9- and 22-page manuscripts for Journal of Wildlife Management.
19 October	Presented a 3-hour lecture on waterfowl management at Salish and Kootenai College--10 students.
26 October	Was interviewed for an article on duck population management in the Flathead Valley by a writer for University of Montana's news magazine, Vision.
6 November	Talked to wildlife careers class on "Career Opportunities with USFWS"--50 students.
6 November	Lectured on waterfowl to University of Montana class, Montana Wildlife--40 students.
13 November	Refereed a 19-page manuscript for TWS Bulletin.
October-November	Trained and scheduled 47 undergraduate wildlife students for work on big game hunter check stations.
October-December	Taught University of Montana course, Ecology and Management of Wetlands--12 students.
January	Interviewed for releases in several area newspapers, "UM Researcher Tackles Duck Decline."
5 February	Spoke to Ravalli County Sportsman's Association on duck population declines and conducted a television review on the same subject.

9 May	Refereed a 90-page manuscript for the Wildlife Techniques Manual, 5th Edition, The Wildlife Society.
10 May	Lectured to University of Montana Chapter of Sigma Xi on "35 Years of Failure in Waterfowl Management."
4 June	Refereed a 20-page manuscript for Journal of Wildlife Management.
11 July	Refereed a 140-page manuscript for Office of Information Transfer, USFWS.
15-17 August	Attended symposium in Jamestown, N.D. on "Managing Predation to Increase Production of Wetland Birds." Presented poster session.
20-24 August	Attended Cooperative Research Unit meetings in Raleigh, N.C.

Roland Redmond

October	Refereed a 28-page manuscript for The Auk.
January	Refereed a 44-page proposal for the National Science Foundation.
April	Evaluated 7 proposals for Five Valleys Audubon Society's 1990 Field Biology Research Awards.
12 April	Presented lecture to University of Montana Chapter of Sigma Xi entitled "Natural History and Ecology of the Bristle-thighed Curlew."
14 April	Attended annual meeting of Pacific Northwest Bird and Mammal Society in Missoula.
25-30 June	Attended joint annual meeting of American Ornithologists' Union and Cooper Ornithological Society, UCLA, Westwood, Calif.
14 September	Discussed conservation of migratory shorebirds with Peace Corps Director and volunteers in Republic of Kiribati.
17 September	Presented talk on nonbreeding ecology of bristle-thighed curlews to officers and crew of U.S. Coast Guard Cutter "Mallow" (WLB 396) while en route from Tarawa to Honolulu.

Les Marcum

3 October	Served on Montana Project Advisory Committee of the Rocky Mountain Elk Foundation.

1989-90	Served on the Blackfoot-Clearwater Wildlife Management Area Advisory Committee.
16-20 October	Attended the International Habitat Futures Workshop at the Pack Experimental Forest in Washington State.
25 October	Participated in Game Damage Workshop in Missoula sponsored by the Rocky Mountain Elk Foundation.
1990	Chairman of the Nominating Committee of The Wildlife Society.
3-4 April	Attended Elk Vulnerability Workshop at Lubrecht Experimental Forest, Montana.
18-20 July	Reviewed Starkey Elk Project near LeGrande, Oregon, and attended Elk Management meeting on the Umatilla National Forest near Pendleton, Oregon.
13 September	Attended meeting of Montana Department of Fish, Wildlife and Parks Commission meeting at the Blackfoot-Clearwater Wildlife Management Area.
20 September	Served on Missoula banquet committee for Rocky Mountain Elk Foundation.

Dan Pletscher

16 October	Gave guest lecture on Montana ungulates to University of Montana undergraduate class, Montana Wildlife.
9 November	Gave guest lecture on careers in wildlife biology to University of Montana class, Careers in Natural Resources.
February-March	Served on search committee for Coordinator of International Natural Resource program.
February-March	Served on search committee for behaviorist in Biological Sciences.
22 February	Gave guest lecture on biodiversity to University of Montana class, Global Resource Problems.
28 February- 2 March	Gave guest lectures on biodiversity to University of Montana Wilderness Management class.
2 March	Talked to Rattlesnake Preschool class about wolves.
18 March	Attended North American Wildlife and Natural Resource Conference in Denver, Colo.; chaired meeting of International Affairs Committee for The Wildlife Society.

20 March	Co-chaired session on "Challenges in International Resource Conservation" at the North American Wildlife and Natural Resources Conference.
25 April	Gave guest lecture on white-tailed deer to University of Montana class, Project Design and Analysis.
17 May	Gave guest lecture on impact of recreation on wildlife to University of Montana class, Managing the Recreational Resource.
17 May	Gave lecture on wolves at Montana State University.
24 May	Gave guest lecture on wolves to University of Montana class, Wildlife Issues.
1 June	Met with Congressman Wayne Owens and Park Service employees in Glacier National Park and discussed wolves and wolf management.
14 July- 23 August	Traveled to Qinghai Province, China, to help graduate student get started on wild yak study. Gave lecture on 24 July on wildlife management in the United States at the Northwest Plateau Institute.
20-22 September	Participated in Boone and Crockett Club quarterly meetings.

Dick Taber

FY90	Appointed to Specialist Groups, "Threatened Deer" and "Ethnozoology," by International Union for the Conservation of Nature (IUCN).
	Appointed to Technical Committee, "Greater Yellowstone Ecosystem Project," by the Wilderness Society.
	Refereed 4 manuscripts for Journal of Wildlife Management.
June	Organized and directed a short course in research techniques for Raghn Chandawat, Wildlife Institute of India, under sponsorship of the International Snow Leopard Trust.

Ana Dronkert-Egnew

7-9 March	Attended Utah-Nevada TWS Section meeting, Wendover, Nev.
5 May	Taught course on river otter and river ecology for Canyon Lands Field Institute, Moab, Utah--7 people.

David Felley

8 March	Subject of newspaper article in the Twin Falls, Idaho Times-News, "New project hoping to find where all the pheasants have gone."
14-17 August	Attended symposium in Jamestown, N.D., "Managing Predation to Increase Production of Wetland Birds."

Nate Hall

1-2 March	Attended annual meeting of the Montana Chapter TWS in Lewistown, Mont.
14-17 August	Presented paper at symposium in Jamestown, N.D., "Managing Predation to Increase Production of Wetland Birds."
29 September-1 October	Attended Idaho Pheasant Symposium in Boise, Idaho.

Richard Harris

April	Invited speaker, 10th Eastern Black Bear Workshop, Bismarck, Arkansas.

Kim Heinemeyer

18-19 April	Attended Northwest Furbearer Symposium in Cranbrook, British Columbia.

Mike Jimenez

12 October	Lectured to children in Sussex Elementary School on wolf recovery in Montana.
26-27 October	Assisted with field trip for Sussex Elementary 7th and 8th graders to Bozeman, Mont. Museum of the Rockies' Wolf Exhibit.
10-11 May	Attended Wolf-Prey Dynamics & Management Symposium, Vancouver, British Columbia.
June	Attended Yellowstone Ecosystem Conference, Laramie, Wyoming.

Eileen Kirsch

22 November	Lectured to Bitterroot Audubon Society, Hamilton, Mont. on "Habitat Changes along the Platte River, Nebraska."

January	Lectured to Botany/Zoology Seminar, University of Montana on "Habitat Selection and Productivity of Least Terns on the Lower Platte River, Nebraska."

Vickie Kurnat

1-4 April	Attended annual meeting of the Montana Wildlife Federation.
14-16 May	Attended Wildlands Coalition Leadership Conference.
14-17 August	Attended symposium in Jamestown, N.D., "Managing Predation to Increase Production of Wetland Birds." Presented poster session entitled "The Use of Artificial Nests as an Index to Natural Nest Success."

Tom Maeder

29 September- 1 October	Attended Idaho Pheasant Workshop, Boise, Idaho.
14-17 August	Attended symposium in Jamestown, N.D., "Managing Predation to Increase Production of Wetland Birds."
1990	Two appearances on KMVT, Channel 11, Twin Falls, Idaho, "Update" news program--1 on pheasant trapping and 1 on pheasant nesting. Thirty-minute TV program on pheasant project on "Sports Eye View," King Video Cable Channel 10. One appearance on KIVB Boise, Channel 6 discussing pheasant trapping. One appearance regarding pheasant project on Nampa, Idaho TV station. Four newspaper articles featuring the pheasant project appeared in Idaho newspapers in 1990--2 in the *Idaho Statesman* and 2 in the Twin Falls *Times-News*.

Denise Pengeroth

7 November	Gave video presentation on historical perceptions of wolves to the 5th graders at Russell School, Missoula.
20-22 April	Attended annual meeting of the Montana Wildlife Federation.
5 June	Re-elected as vice-president of the Western Montana Wildlife Conservation Association.
3-5 August	Attended the Tin Cup Creek Leadership Conference sponsored by Friends of the Bitterroot and the Western Montana Wildlife Conservation Association.

Kevin Roy

4 October	Gave 2-hour presentation on "Furbearing Predators of Montana" to National Bison Range Teachers' Workshop.
30 January	Gave 45-minute presentation to Society of American Foresters, Libby Chapter on "Fisher Reintroduction in the Cabinet Mountains."
6 February	Gave 45-minute presentation to Troy District, Kootenai National Forest on "Fisher Reintroduction in the Cabinet Mountains."
1-4 April	Attended annual meeting of the Montana Wildlife Federation.
18-19 April	Attended Northwest Furbearer Symposium, Cranbrook, British Columbia.
14-16 May	Attended Montana Wildlands Coalition Leadership Conference.
14 July	Interviewed for 15 July article in *Spokesman Review* titled "Project brings back fishers."
15 July	Gave 40-minute presentation to Cabinet Resource Group on "Fisher Reintroduction in the Cabinet Mountains, and Management Suggestions."

Tim Van Deelen

7 April	Lectured on telemetry techniques and beaver research to approximately 12 high school students in connection with the Science Fair activities of University of Montana campus.
18-19 April	Attended Northwest Furbearer Symposium, Cranbrook, British Columbia.
20-21 April	Attended the annual meeting of the Montana Wildlife Federation.
5 June	Re-elected to the board of directors of the Western Montana Wildlife Conservation Association.

PAPERS PRESENTED

Ball, I. J. 16 August 1990. Pair density and reproductive performance of ducks in a low-predator environment. Managing Predation to Increase Protection of Upland Nesting Birds Symposium, Jamestown, N.D.

Burcham, M. G., L. J. Lyon, and C. L. Marcum. 1990. Elk winter habitat selection in response to winter conditions. Proceedings, Western States and Provinces Elk Workshop, Eureka, Calif.

Hall, N. E. 16 August 1990. Effects of skunk removal on duck nest success in western Montana. Managing Predation to Increase Production of Wetland Birds Symposium, Jamestown, N.D.

Kirsch, E. M., and G. Lingle. 16 October 1989. Habitat use and nesting success of Least Terns along the Platte River, Nebraska. Colonial Waterbird Society, Key Largo, Fla.

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Kurnat, V. L. 16 August 1990. The use of artificial nests as an index to natural nest success. Managing Predation to Increase Production of Wetland Birds Symposium, Jamestown, N.D.

Makela, P. D., C. L. Marcum, and L. J. Lyon. 1990. Browse production response to spring prescribed burning and implications for management of the Burdette Creek elk winter range, Montana. Western States and Provinces Elk Workshop, Eureka, Calif.

Marcum, C. L., W. D. Edge, and S. L. Olson-Edge. 24 February 1990. Hedysarum sulphurescens: Ecological distribution and grizzly bear use in northwestern Montana and southeastern British Columbia. Joint Annual Meeting of the Western and Northwest Sections of The Wildlife Society, Reno, Nev.

Marks, J. S., R. L. Redmond, and P. Hendricks. 29 June 1990. Timing of migration, molt, and survival of bristle-thighed curlews on Laysan Island. American Ornithologists' Union/Cooper Ornithological Society annual meeting, U.C.L.A., Westwood, Calif.

O'Gara, B. W. 18 March 1990. Pronghorn-livestock interactions. North American Wildlife Conference, Denver, Colo.

________. 23 May 1990. Capturing pronghorns and evaluating transplant sites. Pronghorn Workshop, Silver Creek, Colo.

________. 5 September 1990. Identifying predator kills. Annual meeting, APHIS ADC, Boulder, Mont.

________. 5 September 1990. Common diseases and parasites of large mammals in Montana. Annual meeting, APHIS ADC, Boulder, Mont.

Sheldon, A. L. 1990. The patchwork West: regional components of aquatic biodiversity. Annual meeting, Western Division of the American Fisheries Society, Sun Valley, Id.

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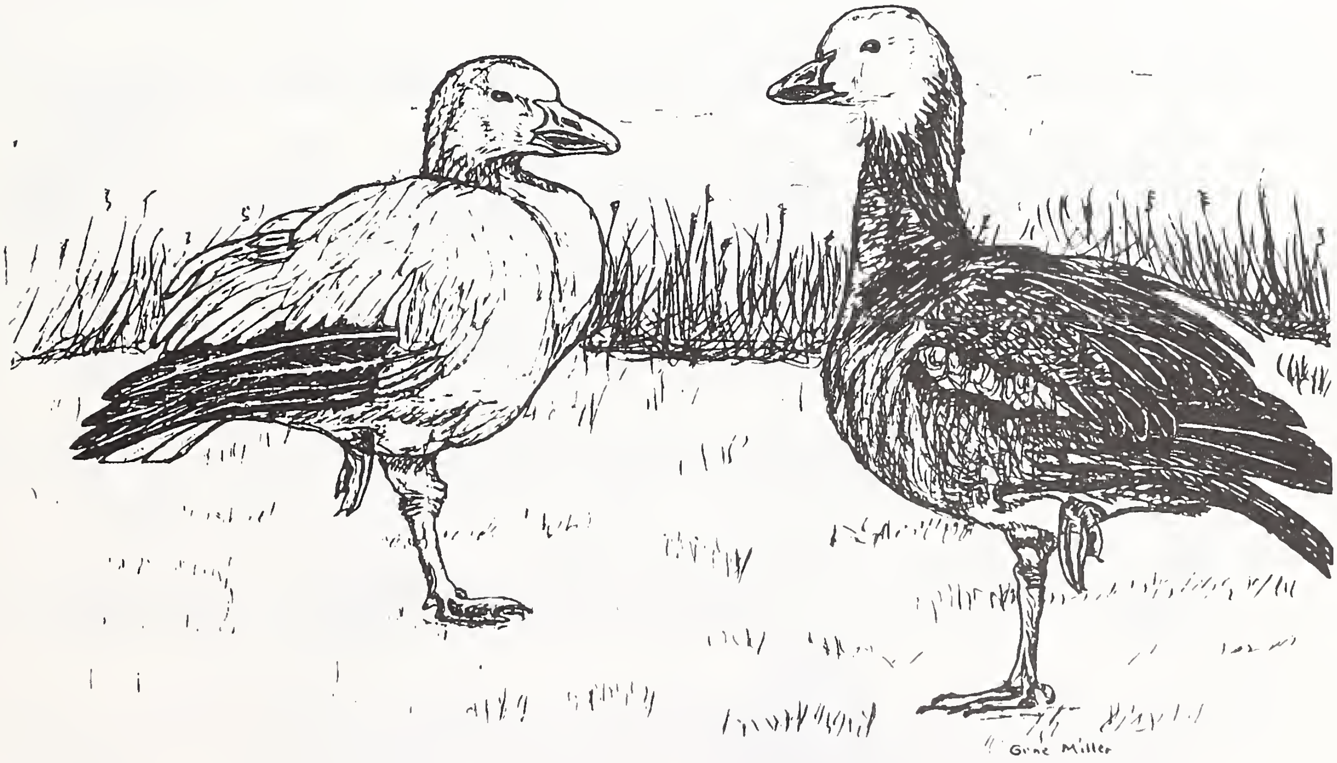

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Ball, I. J., R. D. Bauer, K. Vermeer, and M. J. Rabenberg. 1989. Northwest Riverine and Pacific Coast. Pages 429-449 *in* L. M. Smith, R. L. Pederson, and R. M. Kaminski, eds. Habitat management for migrating and wintering waterfowl in North America. Texas Tech University Press, Lubbock.

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Marks, J. S. 1990. Streaked shearwater (*Calonectris leucomelas*) on Laysan Island: first documented record for Hawaii. 'Elepaio 50:31-32.

McLellan, B. N., and D. M. Shackleton. 1989. Grizzly bears andresource-extraction industries: habitat displacement in response to seismsic exploration, timber harvesting and road maintenance. J. Applied Ecol. 26:371-380.

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Back Cover--Trees are not replacing themselves along the lower Flathead River because of the current operating procedures at Kerr Dam; if this continues, the riparian gallery forest will cease to exist by 2059. Mature trees provide shelter and nesting habitat for a variety of wildlife in this nearly treeless area. Species such as this pileated woodpecker feeding her young excavate nesting cavities that are later used by a variety of wildlife.

Photo by Riley McClelland

Forty-one adult least terns were captured and banded in 1987 and 1988. None of these adults were located and positively identified in later years on the Lower or Central Platte River. This female bird was banded as a chick in 1987 on a Lower Platte sandbar. She nested as a 2 year old on a sandpit on the Central Platte in 1989, and was captured over a nest in 1990 on a Lower Platte sandbar.

Photo by Jeanine Lackey

Least terns nest on bare, dry sandbar and sandpit sites along the Platte River in Nebraska. Typical clutch size is 3 eggs. Both eggs and chicks are cryptically colored, blending well with the sand/gravel substrate. Chicks weigh about 5-6 grams when they hatch and reach 40-45 grams by the time they fledge, approximately 20 days after hatching.

Photo by John Sidle